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AUTOGENOUS EGG PRODUCTION IN THE SALT-MARSH MOSQUITO, *AEDES TAENIORHYNCHUS*

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Female mosquitoes are noted for their blood-feeding activities. Usually a blood meal is a prerequisite to egg maturation, yet more than 40 species of mosquitoes can produce at least the initial egg batch on a blood-free diet (Vinogradova, 1965; Aslamkhan and Laven, 1970). This capacity is called autogeny, while the term anautogeny applies to those cases where blood is normally always necessary for egg development. The females of some species appear to be uniformly autogenous, whereas others have both autogenous and anautogenous populations (Spielman, 1971). Autogeny also occurs in other hematophagous Diptera and it is characteristic of several species which inhabit the tidelands. Salt-marsh tabanids, such as the deer flies, *Chrysops fuliginosus* and *C. atlanticus,* and the horsefly, *Tabanus nigrovittatus*, normally do not bite until they have laid their first batch of eggs (Anderson, 1971; Rockel, 1969; Bosler and Hansens, 1974). Similar feeding patterns have been observed in certain salt-marsh sandflies (Linley and Davies, 1971).

Autogeny was discovered in *Aedes taeniorhynchus* by Lea and Lum (1959) in some Florida populations. More recently, O'Meara and Evans (1973) reported a clinal variation in which both the frequency and the fecundity of autogenous females increased along a North to South gradient. Geographical variation in autogeny has a genetic component that is monofactorial in some species and polygenic in others (O'Meara and Craig, 1969; Rioux, Croset, Gabinaud, Papierok and Belmonte, 1973; Spielman, 1957; Laven 1967). Although populations of *A. taeniorhynchus* differ in their genetic potential for autogeny, genetic factors responsible for these differences have remained poorly defined. Similarly, little is known about the relative influence of specific environmental factors on the occurrence of autogeny in field populations of *A. taeniorhynchus*. The absence of suitable hosts and the inhibition of host seeking by harsh climatic conditions appear to be major factors selecting for autogeny in species inhabiting the variable and at times severe climatic regions of the arctic and temperate zones (Corbet, 1964, 1967; Downes, 1965; Smith and Brust, 1970). Nevertheless, for many species the distribution of autogeny cannot be readily attributed to these or other specific ecological factors (O'Meara and Craig, 1970; Moore, 1963).

In most mosquito species, autogenous females do not blood feed until the initial egg batch is laid (Spielman, 1971; Hudson, 1970). However, ovarian development is more flexible in *A. taeniorhynchus* and autogenous females will readily blood-feed during the first and second day following emergence. This blood-feeding will increase the size of the initial egg batch. Larval nutrition can influence the expression of autogeny, both the frequency and the fecundity of autogenous females being reduced under poor nutritional conditions (Lea, 1964).

The present study examines three aspects of autogenous reproduction in *A. taeniorhynchus*. First, additional information is provided on the occurrence of autogeny throughout the range of this species. Secondly, the genetic regulation of fecundity in autogenous females is investigated with crossing experiments. And finally, for two field populations, comparisons are made between the patterns and rates of blood-feeding and the autogenous potential.

Materials and Methods

The laboratory strains used originated from four different geographical areas: New Jersey (Rutgers), Louisiana (Lake Charles), Florida (North Key Largo), and the Cayman Islands (Grand Cayman). The Rutgers, Lake Charles, and the North Key Largo (NKL) strains have been maintained in the laboratory for 10 or more years. The Cayman strain was started in 1971. In addition to colonized material, eggs of wild *A. taeniorhynchus* were obtained from sod and leaf litter or from females taken in biting or aspirator collections. Mosquito rearing and colony maintenance were performed in an insectary with a controlled environment. The temperature was maintained at 26 ± 1.5° C and the relative humidity at 80 ± 15%, while the daily photoperiod was 14.5 hours. The larval and adult diets were the same as those used by O'Meara and Evans (1973).

For laboratory-reared mosquitoes, ovarian examinations were performed on females only after they were at least 5 days old. Only development to Stage V was classified as autogenous. Both an exochorion and a micropyle apparatus are present at this stage of oocyte development. Fecundity was measured by counting both laid eggs and Stage V "eggs" within the ovary of each female.

At Flamingo and Big Pine Key, Florida, adult mosquitoes were captured with a 12 volt battery-powered aspirator. This device has a cylindrical aluminum frame, 14 inches in diameter and 5 ft in length and a rigid transparent intake. The suction provided by a rear mounted fan pulls mosquitoes into a screen cone which has a net bag at the apex. With the battery contained in a backpack, the aspirator could be operated in the mangrove swamp where it would be difficult to use a trap mounted on a vehicle (Bidlingmayer and Edman, 1967). The power aspirator was used during the daytime when salt-marsh mosquitoes are normally resting on the ground litter or vegetation. Net bags containing mosquito collections were transported in an ice chest from the field to the laboratory where they were stored at −25° C until they could be sorted, identified and tested.

The host-blood sources of engorged females in aspirator collections from Flamingo and Big Pine Key were determined serologically by capillary precipitin tests (Tempelis and Lofy, 1963). Extracts of individual blood meals were first tested with two broadly-reactive screening antisera to establish whether blood meals were mammalian or avian in origin. Reddish extracts failing to react with either antiserum were tested with a third screening antiserum, reactive with amphibian and reptilian bloods. After screening tests, blood-meal extracts were further tested with appropriate antisera specific for different hosts or closely-related host groups within each class of vertebrates. Methods for the preparation of all antisera used as well as the mechanics of the testing are contained in previous publications (Edman, 1971; Edman, Webber and Kale, 1972a).

TABLE I

The occurrence and the fecundity of autogenous females in laboratory strains and field populations of Aedes taeniorhynchus.

Population	Females		
	Number examined	% autogenous	Eggs/autogenous ♀ (Mean ± SE)
(Laboratory colonies)			
Rutgers	542	4.1	23.1 ± 0.6
Lake Charles	277	11.2	28.5 ± 1.6
NKL	102	83.3	71.8 ± 1.8
Cayman	99	83.8	63.1 ± 1.1
(Field populations)*			
Panama, Canal Zone	201	0.5	7.0
Lake Charles, Louisiana	107	1.0	25.0
Savannah, Georgia	112	8.0	48.7 ± 6.2
Fernandina, Florida**	2146	21.6	39.6 ± 0.6
Allenhurst, Florida	307	27.4	45.2 ± 1.8
Oak Hill, Florida**	2086	57.0	45.7 ± 0.4
Sebastian, Florida	148	57.5	52.4 ± 1.6
Jack Island, Florida**	1979	60.7	45.5 ± 0.4
Big Pine Key, Florida	199	74.0	55.4 ± 1.5
Little Duck Key, Florida	200	75.0	63.6 ± 1.2
San Juan, Puerto Rico	43	83.7	48.5 ± 1.0
Grand Cayman Island, British West Indies	337	91.4	57.4 ± 0.6
Flamingo, Florida**	1948	94.4	66.9 ± 0.3

* F_1 progeny of wild-caught females.
** Based on two or more separate field collections.

RESULTS

Every population examined contained a few autogenous females (Table I). Among the laboratory strains, the levels of autogeny were low in Lake Charles and Rutgers and they were high in Cayman and North Key Largo (NKL). For field populations the frequency of autogeny varied over a wide range. In general, the rates were higher in populations from Southern Florida and the Caribbean region than they were in those that originated from northern Florida, Louisiana, Georgia and New Jersey. A major exception to this pattern was the Panama Canal Zone population which had the lowest rate of any group. Geographical variation was also noted in the mean egg production of autogenous females. The mean fecundity was often less than 30 eggs/autogenous female in those populations where the occurrence of autogeny was rare or infrequent. In contrast, significantly higher levels of fecundity were found in all populations which contained mostly autogenous females (Table I).

Inadequate larval and adult nutrition reduces or eliminates autogenous egg production. But since we used a single highly nutritious diet, the observed differences in the occurrence and the expression of autogeny must be genic. We examined the offspring of crosses involving the Rutgers and the Cayman strain

TABLE II

Autogenous egg production in the progeny of crosses involving the Cayman and Rutgers strains.

Cross		Autogenous progeny	
♀	♂	Number examined	Mean number of eggs per autogenous ♀*
Cayman	Cayman	201	62.9 ± 0.8
Rutgers	Rutgers	157	27.0 ± 0.6
Cayman	Rutgers	150	51.7 ± 0.9
Rutgers	Cayman	159	52.1 ± 0.8
Cay/Rut	Cay/Rut	163	42.7 ± 1.1
Rut/Cay	Rut/Cay	446	44.1 ± 0.6
Cayman	Rut/Cay	224	54.2 ± 0.7
Rut/Cay	Cayman	200	52.1 ± 0.9
Rutgers	Rut/Cay	470	33.2 ± 0.4
Rut/Cay	Rutgers	193	36.4 ± 0.9

* Mean ± SE.

in an attempt to obtain additional information on the genetic factors regulating autogenous egg production. The autogenous Cayman females develop more than twice as many eggs as the Rutgers females. The egg production of F_1 and F_2 progeny was intermediate, although the F_1 hybrid more closely approached the level found in the Cayman females. When F_1 hybrids were backcrossed to the Cayman strain the fecundity of the progeny was essentially the same as that found in F_1 hybrids, whereas backcrosses to the Rutgers strain gave females which had a significant reduction in egg production (Table II).

To determine if autogenous and anautogenous females could occur in the same reproductive population we examined the offspring of individual, wild females. Five field sites were tested and at each site *A. taeniorhynchus* females were collected as they attempted to take a human blood meal. These wild females usually produced F_1 progenies containing autogenous and anautogenous mosquitoes (Table III). All but 2 of 103 females from Jack Island and Oak Hill, Florida

TABLE III

The occurrence of autogeny in the F_1 progenies of field collected Aedes taeniorhynchus *females.*

Collecting site	F_1 progenies			
	Number with autogenous females only	Number with anautogenous females only	Number with both types of females	Total number examined
Fernandina	0	11	41	52
Oak Hill	0	0	51	51
Jack Island	2	0	50	52
Flamingo	21	0	29	50
Cayman	2	0	7	9

produced both kinds of offspring. The majority of the wild females from Flamingo, Florida and Cayman Islands gave F_1 progenies with both types of females. Of the 5 field sites examined, only Fernandina females produced some uniformly anautogenous progenies. Nevertheless, even for this site mixed progenies predominated. The frequency of autogeny in the progeny of individual females was highly variable. However, it tended to reflect the overall rates for each population. For example, the level of autogeny did not exceed 20% in most progenies of individual Fernandina females. In contrast, this rate was often greater than 90% in both Cayman and Flamingo progenies.

If the lack or scarcity of suitable hosts is a major factor selecting for genotypes for autogeny in *A. taeniorhynchus,* we would expect such a condition to also influence the mosquito's blood-feeding activities. Without an adequate supply of suitable hosts, engorgement rates would be depressed and the relative frequency of "blood-thirsty" females would be increased. It is difficult to predict how host scarcity would affect the utilization of specific hosts. Previous studies have shown that *A. taeniorhynchus* feeds primarily on certain mammals (Edman, 1971). However, if these mammals are not readily available, then there might be an increase in feeding on other types of vertebrates such as birds, reptiles, and amphibians.

Our evaluation of the blood-feeding patterns and rates was based on the examination of specimens which had been taken with the power aspirator. At both Flamingo and Big Pine Key, Florida, six monthly collections were made during the summer and fall seasons. Resting adults were found to be most common in areas dominated by black mangrove and buttonwood trees. We, therefore, confined most of our sampling to these habitats. Several thousand mosquitoes were collected with the power aspirator. Freezing these specimens proved to be not only an effective method for storage but it also facilitated the work of sorting and classifying the mosquitoes. Engorged and gravid females could be readily identified in frozen specimens because the blood meal or the eggs were clearly visible through the transparent, membranous portions of the abdomen.

All *A. taeniorhynchus* females from the aspirator collections were separated into engorged and non-engorged groups. The latter group was subdivided into gravid and nongravid females. Engorged females can usually be recognized for at least 72 hours after taking a blood meal. But once the meal has been completely digested it is rather difficult to find any direct evidence of a prior blood meal. Egg development initiated by a blood meal is rapid and the completion of egg maturation (Stage V) normally occurs in 4 to 5 days. We considered females to be gravid only if they contained ovaries with development to Stage V. At Big Pine Key the engorgement rate was nearly 3 times the rate found at Flamingo. Gravid females were also more frequent at Big Pine Key (Table IV). Still, most females from both collecting sites were neither gravid nor engorged. We attempted to determine what proportion of these females were at a stage where they would actively seek a blood source. Young adults, less than one day old, are reluctant blood-feeders. Similar behavior is often displayed by older females who have ovarian follicles at Stage III or IV. *Aedes taeniorhynchus* females do not become inseminated until they are at least 1 day old (Edman, Haeger, Bidlingmayer, Dow, Nayar and Provost, 1972). Thus the presence of sperm in the spermatheca is clear evidence that the mosquito is old enough to be a blood-

TABLE IV

The frequency of engorged, gravid and non-gravid females in power aspirator collections.

Collecting site	Females			
	N	% engorged	% non-engorged	
			gravid	non-gravid
Flamingo	13,612	8.1	8.4	83.4
Big Pine Key	6,421	20.9	11.5	67.6

feeder. For each monthly aspirator collection we examined the spermatheca of 50 females. Nearly all of these females had sperm in their spermatheca. Moreover, when we examined the ovaries of 100 or more females from each aspirator collection, only a very small percentage of these non-engorged, non-gravid females had their ovaries at developmental Stages III or IV. The vast majority of these females had their ovaries at Stages I or II (Table V). Therefore, approximately 80% of all females from the Flamingo aspirator collections could be called "bloodthirsty" mosquitoes. In contrast, only about 60% of the Big Pine Key females were in this category.

The results of precipitin tests on engorged mosquitoes are presented in Table VI. The unidentified avian and unidentified mammalian groups represent blood meals which reacted with the appropriate class-specific screening antiserum but were probably too digested for more specific characterizations. A few may represent feeding on hosts which were not included in the test. The blood contained in the guts of engorged females had been obtained from a variety of vertebrate hosts. Yet, overall most mosquitoes had fed on mammals. Nearly 90% of the identified blood meals in Flamingo females came from mammals. For Big Pine Key females, mammal feedings represented about 80% of the total. Rabbits (*Sylvilagus palustris*) were certainly the predominant host for *A. taeniorhynchus* at Flamingo. Among the identified mammalian blood meals, 87% were rabbit's blood. Most engorged mosquitoes from Big Pine Key contained the blood of another mammalian group, the ruminants. The only member of the suborder, Ruminantia, known to be present on this island is the Key deer (*Odocoileus virginianus clavium*). When ruminant blood meals were further characterized by examin-

TABLE V

The degree of ovarian development in wild females that were neither engorged nor gravid.

Collecting site	Number examined	% females at stage		
		I or II	III	IV
Flamingo	1108	93.3	6.4	0.3
Big Pine Key	2171	94.1	5.4	0.4

TABLE VI

Host blood sources of A. taeniorhynchus *collected with the power aspirator at two south Florida localities.*

Blood source	Collection site	
	Big Pine Key	Flamingo
Rabbit	7 (2)*	373 (87)*
Ruminant	379 (96)	0 —
Raccoon	9 (2)	14 (3)
Rodent	0 —	16 (4)
Human	1 (<1)	16 (4)
Other**	0 —	10 (2)
Unidentified mammal	18	29
Total mammal (%)	(79)	(90)
Ciconiiformes	102	21
Passeriformes	0	1
Unidentified avian	6	28
Total avian (%)	(21)	(10)
Total number identified/number tested	522/540	511***/563

* Percent of all identified mammalian hosts.
** Included feedings on opossums and armadillos.
*** Totals for the Flamingo site include one amphibian and two reptilian feedings.

ing their hemoglobin crystals (Washino and Else, 1972), all positive tests indicated the presence of deer blood. Thus most if not all of the ruminant blood meals, which represented 96% of all mammalian feedings by Big Pine Key females, probably came from Key deer.

Every time we sampled a site with the power aspirator, we made a follow-up biting collection the same day. The capacity for autogeny was measured in the F_1 progeny of these wild caught females. Both the frequency and the fecundity of autogenous females were consistently greater at Flamingo than they were at Big Pine Key. From a sample of 1,768 F_1 Flamingo females 86.9% were autogenous and they had a mean autogenous fecundity of 65 eggs per autogenous female. In contrast, only 65.5% ($N = 1{,}697$) of the F_1 Big Pine Key females were autogenous and they had a mean autogenous fecundity of 51 eggs per female.

DISCUSSION

When O'Meara and Evans (1973) examined the seasonal and geographical distribution of autogeny in peninsular Florida, they found a progressive increase in the frequency of autogeny from grassy salt marsh to mangrove sites. No evidence was found for seasonal variation in autogenous genotypes. The findings of the present study also show that autogeny tends to be less frequent in the grassy marshes of the temperate zone than it is in mangrove sites of the subtropics and tropics. However, high rates of autogeny are not always associated with tropical populations of *A. taeniorhynchus*, *e.g.*, the Panama Canal Zone population (Table I).

For other mosquito species geographical variations in autogeny have different patterns. In the North American rock pool mosquito, *Aedes atropalpus,* there are four subspecies. Populations of the type form, which occupy the northern and northeastern portion of this species' range, are uniformly autogenous, whereas the three southern subspecies are usually completely anautogenous (O'Meara and Craig, 1970). Autogeny in *Culex pipiens* is often associated with the range of the temperate zone subspecies, *C. p. pipiens,* but it is normally absent in the tropical subspecies, *C. p. quinquefasciatus* (Spielman, 1971). Rioux, Croset, Gabinaud, Papierok and Belmonte (1973) found a totally autogenous population of *Aedes detritus* in France and a completely anautogenous population in Tunisia. Strains of *A. togoi* vary from wholly autogenous to partially autogenous to anautogenous (Laurence, 1964; Thomas and Leng, 1972). Clearly the patterns of geographical variation among autogenous mosquitoes are quite diverse.

Spielman (1964) found sympatric autogenous and anautogenous populations of the *Culex pipiens* group to be reproductively isolated in nature. Ellis and Brust (1973) have recently delineated sibling species in the *Aedes communis* aggregate. One species, *A. churchillensis,* is uniformly autogenous, while another sibling species, *A. communis* is normally anautogenous. There are both allopatric and sympatric populations of these sibling species. A different situation exists in *A. taeniorhynchus.* Wild caught females usually produce progeny containing both autogenous and anautogenous females (Table III). The two types of females apparently can and often do occur in the same reproductive population.

Moore (1963) and Spadoni, Nelson and Reeves (1974) have found seasonal variations in both the frequency and the fecundity of autogenous females. It is not known if these seasonal patterns involve changes in the frequency of autogenous genotypes. O'Meara (1972) has uncovered a polygenic system regulating the fecundity of autogenous females in *Aedes atropalpus.* When the genome of the autogenous strain was progressively replaced by repeated crossing to the anautogenous forms, a stepwise decrease in autogenous fecundity was noted. However, these intermediate levels of fecundity were rarely found in nature. For most *A. atropalpus* populations, which contained autogenous females, egg production was uniformly high, often equal to the levels obtained with blood-fed, anautogenous females. In contrast, blood-fed anautogenous *A. taeniorhynchus* females can produce much larger initial egg batches than non-bloodfed autogenous females. Moreover, among wild populations the mean autogenous fecundity varies over a wide spectrum (Table I). Results of crossing experiments between the Cayman and Rutgers strains indicate that geographical variation in the fecundity of autogenous *A. taeniorhynchus* is regulated by a genetic system which is rather similar to the one found in *A. atropalpus* (Table II). F_1 hybrids had intermediate levels of egg production, whereas the fecundity of the progeny from backcrosses to the Rutgers strain was significantly lower than the levels found in either the parental Cayman females or the F_1 hybrids.

Genotypes for high fecundity are most prevalent in populations where the majority of the females have the genetic potential for autogeny (Table I). We have conducted some preliminary selection experiments on the Rutgers strain and have increased the rate of autogeny up to the levels normally found in the Flamingo population. But the mean fecundity of this selected line of the Rutgers strain has remained unchanged. Thus there are apparently two distinct yet coadapted genetic systems involved in the production of autogenous eggs.

Unavailability of suitable hosts would surely confer a selective advantage on individuals with autogenous phenotypes. Approximately 80% of the total power aspirator collections from Flamingo was composed of non-engorged females that were both old enough and at the proper developmental stage to actively seek blood sources. Thus the primary factors restricting blood-feeding in the Flamingo population would seem to be part of the mosquito's external environment rather than some condition or mechanism operating within the female mosquito. Clearly, the Big Pine Key population was more successful at obtaining blood meals (Table IV) and the frequency and fecundity of autogenous females were significantly lower than the levels found at Flamingo. Our findings do support the hypothesis that autogenous females are abundant in some populations of *A. taeniorhynchus* because suitable hosts are either unavailable or available only on a very limited basis.

Dispersal flights and migration occasionally transport *A. taeniorhynchus* many miles inland (Provost, 1952, 1957; Bidlingmayer and Schoof, 1957). The blood-feeding characteristics of these mosquitoes can be quite different from those that remain relatively close to the coastal habitat (Edman, 1971). Migrations in salt-marsh mosquitoes have no equivalent return flight. Therefore most of these inland mosquitoes probably do not return to the salt marshes or mangrove swamps. The comparatively short life span of the adult further decreases the likelihood of a successful return flight. Since adequate inland egg laying and aquatic habitats are seldom available, most of the *Aedes taeniorhynchus* occurring several miles from the coast probably do not contribute progeny to the next generation. Thus an evaluation of the factors that select for autogeny in *A. taeniorhynchus* should be based on data derived from collections made near the coastal habitat where mosquitoes are most likely to find proper oviposition and developmental sites for their progeny.

Numerous factors can produce conditions where potential hosts become unavailable. Although adverse climatic conditions severely limit feeding in some species, these factors do not appear to be inhibiting blood-feeding in *A. taeniorhynchus* populations. In fact, many of the highly autogenous populations encounter milder climates than do the anautogenous populations. Historically, the mangrove swamps of the subtropical region tend to be more mammal depauperate than the grassy salt marshes of the temperate zone. Still several species of vertebrates, particularly birds, occur in and near the mangrove and most of them, even some that are abundant, are seldom fed upon by salt-marsh mosquitoes. Obviously, some hosts are not accessible for reasons unrelated to their densities. Certain vertebrates show highly effective anti-mosquito behavior (Edman and Kale, 1971; Webber and Edman, 1972). Such defenses often become more pronounced when attacks from mosquitoes become more intensified (Edman, Webber and Kale, 1972b). During the spring, summer and fall the mangrove swamps in the vicinity of Flamingo, Florida often produce hordes of blood-thirsty mosquitoes which would definitely evoke maximum levels of anti-mosquito defensive behavior in most vertebrates, including man. Besides active defenses, other types of host behavior can also make a potential blood source unavailable. For an animal to be an acceptable host, it must be available when the mosquito normally seeks a blood meal. *Aedes taeniorhynchus* normally seeks a blood meal only during the crepuscular and nocturnal period. The potential availability of some vertebrates is more apparent than real because during the blood seeking period these animals are in microhabitats which are inaccessible to the mosquitoes.

The mosquitoes at Flamingo utilized a wider range of hosts than did those on Big Pine Key. Yet, one group, the ruminants, although the dominant host at Big Pine Key, was not a source of blood for the Flamingo mosquitoes. Big Pine Key contains about 6,000 acres and there are approximately 275 Key deer (*Odocoileus virginianus clavium*) on the island. Unlike the Key deer, the range of the mainland race of the white tailed deer (*O. v. virginianus*) seldom includes the mangrove swamps in the Flamingo and Cape Sable area. Since more than 75% of all mosquito blood meals on Big Pine Key came from the deer, the higher engorgement rates for this population when compared to the Flamingo population can be readily attributed to differences in the availability of this single host species. The percent avian blood-feedings in the Big Pine Key population was double the rate of Flamingo females. Nevertheless, only 21% of the total feedings were from birds. Thus, the contribution of avian hosts to the overall availability of suitable blood-sources was minor when compared to that made by deer (Table VI). Rabbits appeared to represent the most readily available host for *A. taeniorhynchus* at Flamingo. Still, they could not compensate for the absence of deer in view of their much smaller size and the limited area of suitable rabbit habitat at Flamingo. Marsh rabbits were particularly common in the grassy areas associated with roadways and campgrounds near our collection sites at Flamingo but elsewhere they seemed to be far less abundant.

Corbet (1967) found obligate and facultative autogeny in *Aedes nigripes* and *A. impiger*. Females displaying obligate autogeny begin developing their eggs at emergence and are ready to lay them within 10 days. In contrast, females exhibiting facultative autogeny have their ovaries in a state of suspended development for at least 10 days before they start to mature eggs autogenously. A facultative type of autogeny has not been found in *A. taeniorhynchus*. However, the methods used in the present study would not detect facultative autogeny. Laboratory-reared, anautogenous mosquitoes might, under field conditions, be stimulated by chemicals such as phytoecdysones to produce eggs in the absence of a blood meal (Spielman, 1971; Spielman, Gwadz, and Anderson, 1971). But again there is no evidence that shows this actually occurring in any wild mosquito population. Despite the obvious limitations of our methods for detecting autogeny in *A. taeniorhynchus* populations, we were still able to demonstrate genetic differences among populations. And in southern Florida these differences are associated with distinctive blood-feeding patterns and rates.

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Summary

1. A total of 17 populations of *Aedes taeniorhynchus* were examined for the occurrence of autogeny. Every population contained some autogenous as well as

some anautogenous females. In general, populations from the tropics and subtropics had higher rates of autogeny than did temperate zone populations. A major exception to this pattern was a Panama strain where less than 1% of the females were autogenous.

2. Autogenous and anautogenous females occurred in the same reproductive populations. The progeny derived from individual, wild-caught females often contained both reproductive types.

3. The mean fecundity was often less than 30 eggs per autogenous female in those populations where the occurrence of autogeny was rare or infrequent. In contrast, significantly higher levels of fecundity were associated with all populations that contained mostly autogenous females. Geographical variation in autogenous fecundity appears to be regulated by polygenic factors.

4. We compared the blood-feeding characteristics and requirements of two mosquito populations in southern Florida. At Flamingo, Florida, only 8.1% of the females collected with power aspirators were engorged, whereas at Big Pine Key, Florida the engorgement rate was 20.9%. Approximately 80% of all females from the Flamingo collections were at a stage where they could be considered "blood-thirsty" mosquitoes. In contrast, only about 60% of the Big Pine Key females were in this category. Both the frequency and the fecundity of autogenous females were significantly greater at Flamingo.

5. The higher engorgement rate for the Big Pine Key population when compared to the Flamingo population can be readily attributed to the differences in the availability of a single host species, the Key deer.

6. Our findings support the hypothesis that autogenous females are abundant in some populations of *A. taeniorhynchus* because hosts are either unavailable or available on a very limited basis.

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